

AMENDMENTS TO THE CLAIMS

Please amend the Claims as follows:

1. (Currently Amended) A conductive member₁ for use in an image-forming apparatus, which includes a conductive roller or a conductive belt, comprising a conductive layer formed of a conductive polymer composition containing an ionic-conductive addition salt capable of dissociating into cations and anions,

said conductive layer comprising a continuous polymer phase and a discontinuous polymer phase which comprises a first discontinuous polymer phase and a second discontinuous polymer phase; ~~at least one discontinuous polymer phase including at least one first discontinuous polymer phase~~;

said continuous polymer phase and said ~~at least one~~ discontinuous polymer phase forming a sea-island structure;

the polymer composing said first discontinuous polymer phase having a higher degree of affinity for said salt capable of dissociating into cations and anions than the polymer composing said continuous polymer phase;

wherein said salt capable of dissociating into cations and anions is preferentially distributed in said first discontinuous polymer phase, and is only minimally distributed in said second discontinuous polymer phase and said continuous polymer phase;

~~the first discontinuous polymer phase comprising the salt and the polymer having the higher degree of affinity for said salt~~;

~~said conductive layer having a volume resistivity not less than $10^4 \Omega\text{-cm}$ nor more than $10^{12} \Omega\text{-cm}$, when said volume resistivity is measured at a voltage of 100V applied to said conductive polymer composition in accordance with the method specified in JIS K6911,~~

~~wherein said at least one discontinuous polymer phase comprises said first discontinuous polymer phase and a second discontinuous polymer phase and said salt is preferentially distributed in said first discontinuous polymer phase;~~

wherein an affinity between said salt and said polymer composing said first discontinuous polymer phase is higher than an affinity between said salt and said polymer composing said continuous polymer phase, and said affinity between said salt and said polymer composing said continuous polymer phase is higher than an affinity between said salt and said polymer composing said second discontinuous polymer phase;

wherein a volume resistivity or electrical resistance of said first discontinuous polymer phase is lower than ~~a volume resistivity~~ an electrical resistance or volume resistivity of said continuous polymer phase, ~~and the~~ and said electrical resistance of said continuous polymer phase is lower than an electrical resistance of said second discontinuous polymer phase; and

wherein said conductive layer has a volume resistivity not less than $10^4 \Omega\text{-cm}$ nor more than $10^{12} \Omega\text{-cm}$, when said volume resistivity is measured at a voltage of 100V applied to said conductive polymer composition in accordance with the method specified in JIS K6911

~~wherein said salt is an anion containing salt having fluoro groups and sulfonyl groups.~~

2. (Currently Amended) The conductive member according to claim 1, wherein a volume resistivity of said first discontinuous polymer phase in which said salt capable of dissociating into cations and anions is preferentially distributed is ρ_{v1} and said continuous polymer phase is ρ_{v2} , and ρ_{v1} and ρ_{v2} relate as follows:

$$0.2 < \log_{10} \rho_{v2} - \log_{10} \rho_{v1} \leq 5 .$$

3. (Previously Presented) The conductive member according to claim 1, wherein a weight ratio of said discontinuous polymer phase to said continuous polymer phase is 5:95 to 75:25.

4. (Cancelled)

5. (Currently Amended) The conductive member according to claim 1, wherein said salt capable of dissociating into cations and anions has an electrical conductivity of not less than 2.3mS/cm, when said electrical conductivity is measured at a concentration of a salt of 0.1 mol/liter at 25°C in a mixed solvent of propylene carbonate and dimethyl carbonate, wherein a ratio between propylene carbonate and dimethyl carbonate is 1:2 in volume fraction.

6. (Cancelled)

7. (Currently Amended) The conductive member according to ~~claim 1~~ claim 34, wherein said salt capable of dissociating into cations and anions is a lithium salt, a potassium salt, a quaternary ammonium salt or an imidazolium salt.

8. (Original) The conductive member according to claim 1, wherein said conductive polymer composition is a vulcanized or a thermoplastic elastomer composition.

9. (Previously Presented) The conductive member according to claim 1, wherein each of polymers in said continuous polymer phase and said discontinuous polymer phase has a glass transition temperature T_g not more than -40°C .

10. (Previously Presented) The conductive member according to claim 1, wherein said continuous polymer phase contains low nitrile acrylonitrile-butadiene rubber; said first discontinuous polymer phase contains polyether polymer; and said second discontinuous phase contains ethylene-propylene-diene copolymer; and

said salt is preferentially distributed in said polyether polymer of said first discontinuous polymer phase.

11. (Previously Presented) The conductive member according to claim 1, wherein said continuous polymer phase contains low nitrile acrylonitrile-butadiene rubber; said first discontinuous polymer phase contains polyether polymer; and said second discontinuous polymer phase contains ethylene-propylene-diene copolymer; and

a volume fraction of said continuous phase is higher than a volume fraction of said second discontinuous polymer phase; and said volume fraction of said second discontinuous polymer phase is higher than a volume fraction of said first discontinuous polymer phase.

12. (Previously Presented) The conductive member, according to claim 11, comprising 50 wt% to 90 wt% of said low-nitrile acrylonitrile-butadiene rubber; 10 wt% to 40 wt% of said ethylene-propylene-diene copolymer; 0.5 wt% to 25 wt% of said polyether polymer; and 0.1 wt% to 2 wt% of said salt.

13. (Previously Presented) The conductive member according to claim 10, wherein said polyether polymer comprises a copolymer of ethylene oxide-propylene oxide-allyl glycidyl ether.

14. (Previously Presented) The conductive member according to claim 1, wherein said conductive polymer composition has a compression set not more than 30%, when said compression set is measured at a temperature of 70°C for 22 hours to 24 hours at a compression rate of 25% in accordance with permanent set testing methods for rubber, vulcanized or thermoplastic specified in JIS K6262.

15. (Previously Presented) The conductive member according to claim 1, wherein the conductive layer comprises a roller having said conductive layer or a belt having said conductive layer.

16. (Previously Presented) The conductive member according to claim 1, wherein the conductive member comprises a conductive roller having an electric resistance R in Ω measured by applying a constant voltage of 1000V thereto for 96 hours successively at a temperature of 23°C and a relative humidity of 55%, wherein $\Delta \log_{10} R = \log_{10} R(t=96 \text{ hours}) - \log_{10} R(t=0 \text{ hour})$ indicating a rise amount of said electrical resistance R in Ω is not more than 0.5.

17. (Previously Presented) The conductive member consisting of a conductive roller according to claim 1, wherein when an electrical resistance R in Ω of said conductive roller is measured at a temperature of 10°C and a relative humidity of 15% and at a temperature of 32.5°C and a relative humidity of 90%, wherein $\Delta \log_{10} R = \log_{10} R(\text{temperature of } 10^\circ\text{C and relative humidity of } 15\%) - \log_{10} R(\text{temperature of } 32.5^\circ\text{C and relative humidity of } 90\%)$ indicating a dependence degree of said electrical resistance on environment is not more than 1.7.

18. (Previously Presented) The conductive member according to claim 1, wherein said conductive layer is a conductive roller or a conductive belt formed as a cellular material layer having an expansion ratio of not less than 100% nor more than 500% and a hardness of not more than 60 degrees, when said hardness is measured by the durometer of type E specified in JIS K6253.

19. (Previously Presented) The conductive member according to claim 1, wherein the conductive member is a conductive belt having a volume resistivity ρ_v in $\Omega\text{-cm}$ of a sample of

said conductive belt that is measured by applying a constant voltage of 1000V to said sample having a thickness of 0.25mm for five hours successively at a temperature of 23°C and a relative humidity of 55%, $\Delta \log_{10} \rho_v = \log_{10} \rho_v(t=5 \text{ hours}) - \log_{10} \rho_v(t=0 \text{ hour})$ indicating a rise amount of said volume resistivity is not more than 0.5.

20. (Previously Presented) The conductive member according to claim 1, wherein the conductive member is a conductive belt having a volume resistivity ρ_v in $\Omega \cdot \text{cm}$ of said conductive belt is measured at a temperature of 10°C and a relative humidity of 15% and at a temperature of 32.5°C and a relative humidity of 90%, $\Delta \log_{10} \rho_v = \log_{10} \rho_v(\text{temperature of } 10^\circ\text{C and relative humidity of } 15\%) - \log_{10} \rho_v(\text{temperature of } 32.5^\circ\text{C and relative humidity of } 90\%)$ indicating a dependence degree of said volume resistivity on environment is not more than 1.7.

21. (Currently Amended) The conductive member according to ~~claim 31~~, claim 1, wherein the conductive member is a flame retardant seamless belt having said conductive polymer composition that comprises 50 to 95 parts by weight of a polyester thermoplastic elastomer added to 100 parts by weight of an entire polymer component; 15 wt% to 40 wt% of melamine cyanurate serving as a flame-retardant additive added to 100 wt% of said conductive polymer composition; 0.01 parts by weight to 3 parts by weight of said salt, which can dissociate into cations and at least an anion shown by a chemical formula 1, added to 100 parts by weight of said entire polymer component; and not less than 5 parts by weight nor more than 50 parts by weight of a copolymer, having a polyether block, added to 100 parts by weight of said polyester thermoplastic elastomer; and

said conductive polymer composition has a volume resistivity of not less than $1.0 \times 10^6 \Omega \cdot \text{cm}$ nor more than $1.0 \times 10^{12} \Omega \cdot \text{cm}$

Chemical Formula 1



where X_1 and X_2 denote functional group which contains C, F-, and $-\text{SO}_2-$ and in which the number of carbon atoms is one to eight.

22. (Previously Presented) The conductive member according to claim 21, wherein a volume resistivity of said belt measured immediately after a constant voltage of 1000V is applied to a sample of said belt having a thickness of 250 μm at a temperature of 23°C and a relative humidity of 55% is ρ_v at $t=0$ hour and that a volume resistivity measured after said voltage is applied to said sample for five hours successively is ρ_v at $t=\text{five hours}$, and the ρ_v at $t=\text{five hours}$ and the ρ_v at $t=0$ hour relate as follows:

$$\log_{10}\rho_v(t=5 \text{ hours}) - \log_{10}\rho_v(t=0 \text{ hour}) \leq 0.5 .$$

23. (Previously Presented) The conductive member according to claim 21, wherein a glass transition temperature T_g of said copolymer having said polyether block is not more than -40°C ; and

a weight of said copolymer, having said polyether block, contained in a material of said belt is 1.6 to 3333 times as large as that of said salt, which can dissociate into cations and at least an anion shown by said chemical formula 1.

24. (Previously Presented) The conductive member according to claim 21, wherein said X_1^- of said chemical formula 1 is $C_{n1}H_{m1}F_{(2n1-m1+1)}-SO_2^-$, and X_2^- of said chemical formula 1 is $C_{n2}H_{m2}F_{(2n2-m2+1)}-SO_2^-$ where n_1 and n_2 are integers not less than 1, and m_1 and m_2 are integers not less than 0; and

a cation making a pair with said anion, shown by said chemical formula 1, which constitutes said salt is a cation of any one of alkali metals including lithium, group 2A metals, and transition metals, and amphoteric metals.

25. (Previously Presented) The conductive member according to claim 21, wherein when a volume resistivity of said conductive member is measured at a temperature of 10°C and a relative humidity of 15% and at a temperature of 32.5°C and a relative humidity of 90%, and the volume resistivities relate as follows:

$\log_{10}pv(\text{temperature of } 10^\circ\text{C and relative humidity of } 15\%) - \log_{10}pv(\text{temperature of } 32.5^\circ\text{C and relative humidity of } 90\%) \leq 2.5,$

where pv is the volume resistivity.

26. (Original) The conductive member according to claim 21, having at least one layer formed on a peripheral surface thereof.

27. (Previously Presented) An image-forming apparatus comprising the conductive member according to claim 1.

28. (Currently Amended) A method of manufacturing ~~a conductive~~ the conductive member according to claim 1, ~~having a conductive layer for use in an image-forming apparatus,~~ comprising the steps of:

kneading or blending ~~a salt~~ said salt capable of dissociating into cations and anions uniformly ~~with a~~ with said polymer comprising said first ~~that will form a~~ discontinuous polymer phase in ~~the molded or formed conductive member to~~ which said salt capable of dissociating into cations and anions is preferentially distributed to form a compound or a mixture of said salt and said polymer;

~~adding a~~ adding said polymer composing a ~~comprising said~~ continuous polymer phase ~~in the molded or formed conductive member and a~~ and said polymer composing another said ~~second~~ discontinuous polymer phase ~~in the molded or formed conductive member~~ to said compound or said mixture; and kneading a mixture of said all components to form a conductive polymer composition; and

molding or forming said conductive polymer composition by heating said conductive polymer composition into whole or a part of said conductive member for use ~~in an~~ in said image-forming apparatus.

29. (Currently Amended) A method of manufacturing a belt, comprising the steps of:

fusing and kneading, by an extruder, a conductive master batch containing a copolymer having a polyether block and 1 to 20 wt% of said anion-containing salt shown by a chemical formula 1, a flame-retardant additive, and a thermoplastic composition containing not less than 50 wt% of a polyester thermoplastic elastomer to form a mixture; and

extruding said mixture from an annular die and molding said mixture into a shape of a seamless belt by using a sizing die

Chemical Formula 1



where X_1 and X_2 denote functional group which contains C, F-, and $-SO_2-$ and in which the number of carbon atoms is one to eight,

wherein the belt is the conductive member according to claim 21.

30. (Original) The method of manufacturing a belt according to claim 29, wherein said flame-retardant additive and thermoplastic composition containing said polyester thermoplastic elastomer are kneaded and supplied to said extruder as a flame-retardant master batch; and said mixture of said conductive master batch and said flame-retardant master batch and other components are extruded vertically from said annular die.

31. (Currently Amended) ~~A conductive~~ The conductive member according to claim 1 ~~for use in an image forming apparatus, comprising a conductive layer formed of a conductive polymer composition containing an ionic conductive addition salt;~~

~~said conductive layer comprising a continuous polymer phase and at least one discontinuous polymer phase including at least one first discontinuous polymer phase;~~

~~said continuous polymer phase and said at least one discontinuous polymer phase forming a sea-island structure;~~

~~the polymer composing said first discontinuous polymer phase having a higher degree of affinity for said salt than the polymer composing said continuous polymer phase;~~

~~the first discontinuous polymer phase comprising the salt and the polymer having the higher degree of affinity for said salt;~~

~~said conductive layer having a volume resistivity not less than $10^4 \Omega \cdot \text{cm}$ nor more than $10^{12} \Omega \cdot \text{cm}$, when said volume resistivity is measured at a voltage of 100V applied to said conductive polymer composition in accordance with the method specified in JIS K6911;~~

wherein said salt capable of dissociating into cations and anions has an electrical conductivity of not less than 3.5 mS/cm when said electric conductivity is measured at a concentration of a salt of 0.1 mol/liter at 25°C in a mixed solvent of propylene carbonate and dimethyl carbonate, wherein a ratio between propylene carbonate and dimethyl carbonate is 1:2 in volume fraction.

32. (Currently Amended) ~~A conductive~~ The conductive member according to claim 1, for use in an image-forming apparatus, comprising a conductive layer formed of a conductive polymer composition containing an ionic conductive addition salt;

~~said conductive layer comprising a continuous polymer phase and at least one discontinuous polymer phase including at least one first discontinuous polymer phase;~~

~~said continuous polymer phase and said at least one discontinuous polymer phase forming a sea-island structure;~~

~~the polymer composing said first discontinuous polymer phase having a higher degree of affinity for said salt than the polymer composing said continuous polymer phase;~~

~~the first discontinuous polymer phase comprising the salt and the polymer having the higher degree of affinity for said salt;~~

~~said conductive layer having a volume resistivity not less than $10^4 \Omega \cdot \text{cm}$ nor more than $10^{12} \Omega \cdot \text{cm}$, when said volume resistivity is measured at a voltage of 100V applied to said conductive polymer composition in accordance with the method specified in JIS K6911;~~

~~wherein the~~ wherein said conductive polymer composition is not given conductivity by an electroconductive filler, such that a circumferential nonuniformity or in-plane nonuniformity of the electrical resistance of the conductive member is from 1.0 to 1.15.

33. (Currently Amended) ~~A conductive~~ The conductive member according to claim 1, for use in an image-forming apparatus, comprising a conductive layer formed of a conductive polymer composition containing an ionic conductive addition salt,

~~said conductive layer comprising a continuous polymer phase and at least one discontinuous polymer phase including at least one first discontinuous polymer phase;~~

~~said continuous polymer phase and said at least one discontinuous polymer phase forming a sea-island structure;~~

~~the polymer composing said first discontinuous polymer phase having a higher degree of affinity for said salt than the polymer composing said continuous polymer phase;~~

~~the first discontinuous polymer phase comprising the salt and the polymer having the higher degree of affinity for said salt;~~

~~said conductive layer having a volume resistivity not less than $10^4 \Omega\text{-cm}$ nor more than $10^{12} \Omega\text{-cm}$, when said volume resistivity is measured at a voltage of 100V applied to said conductive polymer composition in accordance with the method specified in JIS K6911;~~

~~wherein said at least one discontinuous polymer phase comprises said first discontinuous polymer phase and a second discontinuous polymer phase and said salt is preferentially distributed in said first discontinuous polymer phase;~~

~~wherein an affinity between said salt and said polymer composing said first discontinuous polymer phase is higher than an affinity between said salt and said polymer composing said continuous polymer phase, and said affinity between said salt and said polymer composing said continuous polymer phase is higher than an affinity between said salt and said polymer composing said second discontinuous polymer phase;~~

~~wherein a volume resistivity of said first discontinuous polymer phase is lower than a volume resistivity of said continuous polymer phase, and the electrical resistance of said~~

~~continuous polymer phase is lower than an electrical resistance of said second discontinuous polymer phase;~~

~~wherein a~~ wherein said volume resistivity of said first discontinuous polymer phase in which said salt capable of dissociating into cations and anions is preferentially distributed is ρv_1 and said continuous polymer phase is ρv_2 , and ρv_1 and ρv_2 relate as follows:

$$0.2 < \log_{10} \rho v_2 - \log_{10} \rho v_1 \leq 5;$$

wherein a weight ratio of said discontinuous polymer phase to said continuous polymer phase is 5:95 to 75:25;

wherein said salt capable of dissociating into cations and anions has an electrical conductivity of not less than 2.3mS/cm, when said electrical conductivity is measured at a concentration of a salt of 0.1 mol/liter at 25°C in a mixed solvent of propylene carbonate and dimethyl carbonate, wherein a ratio between propylene carbonate and dimethyl carbonate is 1:2 in volume fraction; ~~and~~

~~wherein said salt is an anion-containing salt having fluoro groups and sulfonyl groups.~~

34. (New) The conductive member according to claim 1, wherein said salt capable of dissociating into cations and anions is an anion-containing salt having fluoro groups and sulfonyl groups.